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Clinical features of Egyptian children referred for evaluation of swallowing difficulty, a single tertiary center study

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Abstract

Background: Research reveals that dysphagia impacts quality of life negatively. Early detection of dysphagia is essential to prevent or minimize complications.

Purpose: To examine the causes and effects of dysphagia by studying patients' characteristics; demographic data, anthropometric measurements and relevant medical past history.

Methods: The study included 87 children (6 months-7 years) presenting with swallowing difficulties and referred for dysphagia assessment. Descriptive and clinical data were collected. Descriptive data included age, weight and length/height. Clinical data included history of prematurity, diagnosis, history of NICU or hospital admission, nutritional history and history of nasogastric feeding.

Results: 43.68% of patients had history of hospital admission because of chest infection and 33.3% needed NICU admission. Anthropometric measurements showed 51.7% were underweight and severely underweight, and 63.2% were wasted and severely wasted. Neurological disease was the most common diagnosis compromising 53% of the patients. The mean weight for age Z-score of neurologically impaired patients was -2.88 ± 2.57 , which was significantly different those with no neurological impairment -1.63 ± 2.41 ($P= 0.025$). There was a statistically significant difference between the mean weight for length Z-scores of the neurologically affected and non-affected patients -2.12 ± 3.66 vs. -0.54 ± 2.62 ($P= 0.009$).

Conclusion: Dysphagia affects children health, growth and development; causing repeated hospital admissions and failure to thrive. The most common cause of dysphagia was neurological disease. Neurologically affected children had higher percentage of being underweight and severely underweight than children with no neurological impairment.

Keywords: dysphagia, malnutrition, underweight, neurology

Background

Infancy and childhood are considered a time of unparalleled physical growth and cognitive development. Therefore, infants and children must be able to reliably and safely consume adequate energy and nutrients in order to reach their linear and neurological growth potential. Left untreated, swallowing difficulties can lead to failure to thrive, gastroesophageal reflux, aspiration pneumonias, and/or the inability to establish and maintain proper nutrition and hydration (Dodrill & Gosa, 2015)

Early detection of dysphagia in infants and children is essential to prevent or minimize complications. Evaluation of an infant or child with suspected swallowing dysfunction starts with a clinical feeding evaluation and, in most cases, proceeds to an instrumental evaluation. Videofluoroscopic swallow study (VFSS) and fiberoptic endoscopic evaluation of swallowing (FEES) are the most commonly used tools for dysphagia detection and evaluation. Each study has individual strengths and weaknesses, though the two are often complimentary (Tutor & Gosa, 2012)

Research reveals that dysphagia impacts quality of life negatively, but the nature and extent of these impacts are not well understood (Smith et al., 2022). This study aims to examine the causes and effects of dysphagia by studying patients' characteristics; demographic data, anthropometric measurements and some relevant medical past history.

Materials and Methods

The study was a prospective cross-sectional study. It included 87 children presenting with swallowing difficulties and referred for dysphagia assessment. Children between 6 months and 7 years of age were included. Dysphagia was defined as difficult or abnormal swallowing, or any disruption to the swallow sequence that results in compromise to the safety, efficiency, or adequacy of nutritional intake (Dodrill & Gosa, 2015).

The study was conducted at the swallowing clinic of the unit of Phoniatics, ENT Department and the Department of Pediatrics, Children's Hospital, Cairo University. Recruitment of the patients commenced in January 2019 and continued till March 2020. The study was commenced after approval of the Ethical Committee of Faculty of Medicine, Cairo University. Informed consent was obtained from all parents of the children who participated in the study.

The following data were collected from all the patients:

- Descriptive data including age, weight and length/height
 - Anthropometric measurements were plotted on appropriate growth curves for age and sex, according to the recommendations of CDC in September 2010; WHO growth curves for infants and toddlers under two years of age, and the CDC/NCHS growth references for children two years and older (Grummer-Strawn et al., 2010). Z-scores were used, which are values that represent the number of SDs from the mean height and weight values for age. A child whose Z-score for weight for age is <-2 or <-3 is considered underweight or severely underweight respectively. A child whose Z-score for height/length for age is <-2 or <-3 is considered stunted or severely stunted respectively. A child whose Z-score for weight-for-height/length is <-2 or <-3 is considered wasted or severely wasted respectively (Dibley et al., 1987).
- Clinical data:
 - If the child was born full- term/preterm
 - Birth-weight
 - Diagnosis and onset of dysphagia
 - History of previous admission to a NICU, hospital ward or ICU and the duration of the stay.
 - History of mechanical ventilation and duration
 - Exclusively breastfed or not
 - Age of introduction of semi-solids
 - History of tube feeding and duration

Statistical Analysis

Data was coded and entered using the statistical package for the Social Sciences (SPSS) version 26 (IBM Corp., Armonk, NY, USA). Data was summarized using mean, standard deviation, median, minimum and maximum in quantitative data and using frequency (count) and relative frequency (percentage) for categorical data. Comparisons between quantitative variables were done using the non-parametric Mann-Whitney test. For comparing categorical data, Chi square (χ^2) test was performed. Exact test was used instead when the expected frequency is less than 5. Correlations between quantitative variables were done using Spearman correlation coefficient. P-values less than 0.05 were considered as statistically significant.

Results

The study included a group of 87 patients presenting with dysphagia at Cairo University Hospitals outpatient clinics. The median age of the patients was 19 (6-78) months and 51.7% were females. About one third of the patients had a history of NICU admission and 17.2% had history of previous mechanical ventilation. Exclusive breastfeeding was found in 49.4% of the patients, and 64.4% had food introduced before the age of 6 months. One third of the patients had required nasogastric tube feeding at least once before as shown in table 1.

Table 1: Characteristics and medical history of children referred for dysphagia assessment

	Patients (n=87)
Age in months [mean (SD)]	25.4 (\pm 18.7)
Gender [%]	
Male	48.3%
Female	51.7%
Preterm [%]	21.8%
Gestational age [%]	
<28 weeks	1.1%
28-33 weeks	3.4%
34-37 weeks	18.4%
>37 weeks	77.0%
Exclusive breastfeeding [%]	49.4%
Food introduction before 6 months [%]	64.4%
Previous NICU admission [%]	33.3%
Duration of NICU admission (days) [median (range)]	14 (1-120)
Previous hospital admission due to chest condition [%]	43.68%
Duration (days) of hospital admission due to chest condition [median (range)]	30 (3-600)
Previous ICU admission [%]	21.84%
Previous need for mechanical ventilation [%]	17.2%
Need for tube feeding [%]	33.3%

Anthropometric measurements showed that 51.7% of patients were underweight and severely underweight, and 63.2% were wasted and severely wasted as represented in table 2.

Table 2: Anthropometrics of children referred for dysphagia assessment

	Patients (n=87)
Weight for age Z-score [mean (SD)]	-2.29 (\pm 2.56)
Percentage of underweight and severely underweight children	51.7%
Length (or height) for age Z-score [mean (SD)]	-2.51 (\pm 2.01)
Percentage of stunted and severely stunted children	63.2%
Weight/Length Z-score [mean (SD)]	-1.38 (\pm 3.29)
Percentage of wasted and severely wasted children	35.6%
Weight for age Z-score [mean (SD)]	-2.29 (\pm 2.56)
Weight for age Z-score [mean (SD)]	-2.29 (\pm 2.56)

Neurologically affected subjects within the study group

Forty-six patients with neurological disorders were included in the study group, which represented 52.9% of the total patients (figure 1). Their median age was 25.5 months and ranged from 6 to 78 months, of which 50% were females.

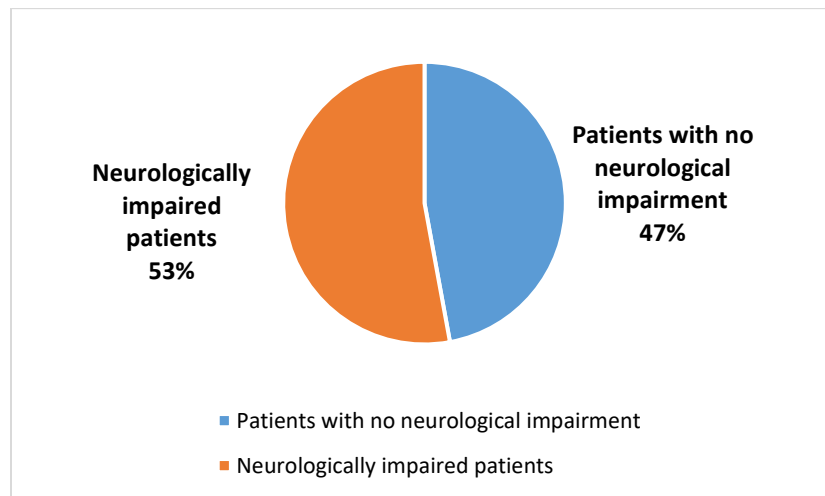


Figure 1: Pie chart representing patients with neurological impairment

Table 3: Comparison between characteristics and medical history of neurologically impaired and non-impaired patients

	Neurologically impaired (n=46)	No neurological impairment (n=41)	P value
Preterm [%]	17.4%	26.8%	0.288
Gestational age [%]			0.646
<28 weeks	2.2%	0%	
28-33 weeks	2.2%	4.9%	
34-37 weeks	15.2%	22%	
>37 weeks	80.4%	73.2%	
Exclusive breastfeeding [%]	47.8%	51.2%	0.752
Food introduction before 6 months [%]	56.5%	73.2%	0.106

Weight Z score [mean (SD)]	-2.88 (± 2.57)	-1.63 (± 2.41)	< 0.025
Underweight and severely underweight children [%]	63%	39%	0.025
Length (or height) Z score [mean (SD)]	-2.89 (± 2.06)	-2.08 (± 1.98)	0.17
Stunted and severely stunted children [%]	69.6%	56.1%	0.193
Weight/Length Z score [mean (SD)]	-2.12 (± 3.66)	-0.54 (± 2.62)	0.009
Wasted and severely wasted children [%]	47.8%	22%	0.012
Previous NICU admission [%]	34.8%	31.7%	0.761
Duration of NICU admission (days) [median (range)]	11 (1-73)	16 (1-120)	0.398
Previous hospital admission due to chest condition [%]	41.3%	46.34%	0.52
Duration (in days) of hospital admissions due to chest condition [median (range)]	30 (3-600)	29 (9-340)	0.233
Previous ICU admission [%]	23.9%	21.95%	0.894
Previous need for mechanical ventilation [%]	19.6%	14.6%	0.543
Need for tube feeding [%]	39.1%	26.8%	0.224

The mean weight for age Z-score was -2.88 ± 2.57 , which was significantly different from the mean weight for age Z-score for those with no neurological impairment -1.63 ± 2.41 ($P= 0.025$). The mean height for age Z-score for patients with and without neurological disorders were -2.89 ± 2.06 vs. -2.08 ± 1.89 respectively ($P= 0.17$). There was a statistically significant difference between the mean weight for length Z-scores of the neurologically affected and non-affected patients -2.12 ± 3.66 vs. -0.54 ± 2.62 ($P= 0.009$). Characteristics of the neurologically impaired patients are discussed in more details in table 3.

Discussion

Infants and children are typically referred for swallow evaluation and assessment if they have signs or symptoms denoting aspiration. The present study identified the demographic data, anthropometric measurements and relevant medical past history of 87 children referred for dysphagia assessment in Cairo University hospitals.

Our results showed that 21.8% of patients were preterm. Results are consistent with Rommel et al., that analyzed the clinical data from 700 children aged less than 10 years who were examined for severe feeding problems. The data obtained revealed that infants born before 34 weeks have more oral sensory problems, and authors concluded that infants born preterm and/or with a birthweight below the tenth percentile for gestational age are at greater risk for developing feeding disorders (Rommel et al., 2003). Another study by Bae et al. reviewed the medical records of 352 children with suspected dysphagia who were referred for instrumental evaluation of swallowing. The authors found that 18% of the subjects were born prematurely, and that children under two years of age who were born prematurely at less than 34 weeks of gestation were significantly ($P=0.026$) more likely to show penetration or aspiration. Bae et al., also found that the most common condition (40%) associated with suspected dysphagia was central nervous system disease, similar to our study results; 52.9% of our recruited patients were neurologically impaired (Bae et al., 2014).

Studying the patients past medical history, there was a high percentage of children in the patients group with previous history of hospital admission due to chest condition or ICU admission. Additionally, 17.2% of the patients group were mechanically ventilated. This data is broadly consistent with the results of a retrospective observational study performed on 102 children, aged between 1 month and 2 years, admitted to the pediatric hospital unit due to respiratory disease in Brazil. *Sassi et al.* showed that the clinical markers of orotracheal intubation ($P= 0.042$), duration of orotracheal intubation ($P = 0.025$), and days of hospitalization ($P = 0.037$) were significant in children with moderate-severe dysphagia. The authors concluded that neurologically intact children with respiratory disease who were submitted to prolonged orotracheal intubation (over 48 hours) should be prioritized for receiving a detailed swallowing assessment (*Sassi et al.*, 2018). Another interesting research, published in 2019, studied the post-extubation dysphagia in pediatric populations. It was a retrospective, observational cohort study of patients aged 0 to 16 years admitted between 2011 and 2017. Out of 372 patients, post-extubation dysphagia was observed in 29% of patients, and for every hour of intubation, odds of dysphagia increased by 1.7% ($P<0.0001$) (*Hoffmeister et al.*, 2019). Hence, routine screening and early referral to speech-language pathologists, for swallowing evaluation, is recommended with history of recurrent hospital and ICU admissions, especially if prolonged.

There was a high percentage of underweight and severely underweight children (51.7 %), and a high percentage of stunted and severely stunted children (63.2%). A high index of suspicion should be raised when parental complaints of feeding difficulties are accompanied by signs of malnutrition.

When the patients group in the current study was sub-classified into neurologically impaired and neurologically intact patients, it was noticed that the percentage of underweight and severely underweight subjects in the neurologically impaired patients was significantly higher than that in neurologically intact subjects (63% vs. 39% respectively, $P= 0.025$), with mean weight for age/gender Z-scores -2.88 ± 2.57 vs. -1.63 ± 2.41 respectively ($P= 0.025$). A handful of studies assessed feeding dysfunction and its association with health and nutritional status in children with cerebral palsy (*Bell et al.*, 2019; *Fung et al.*, 2002; *Troughton & Hill*, 2001). A large multicenter study was conducted by *Fung et al.* describing children between the ages of 2 to 18 years with cerebral palsy, residing in 6 geographic areas of the United States and Canada. Out of 173 children with cerebral palsy exclusively fed by mouth, 46.24% were reported to have some grade of feeding dysfunction, 36.25% of which with moderate to severe feeding dysfunction. There was a significant difference in the mean weight Z-scores of the subjects having no vs. mild vs. moderate to severe feeding dysfunction -1.68 ± 1.98 , -2.27 ± 2.27 and -3.1 ± 2.74 ($P= 0.005$). Moreover, there was a significant difference in the mean height Z-scores between the same groups -2.63 ± 1.98 , -2.82 ± 1.61 and -3.73 ± 1.31 respectively ($P= 0.006$). From such results, *Fung et al.* concluded that oral motor dysfunction was responsible, in part, for limited oral intake and subsequently growth failure in children with severe cerebral palsy, and the severity of feeding dysfunction correlated to poorer growth (*Fung et al.*, 2002).

Conclusions

At a single tertiary referral center in Egypt, children presenting with dysphagia had a high incidence of repeated hospital admissions, NICU and ICU admissions with long hospital stay. Using appropriate growth curves for age and sex, a high percentage of children were underweight and severely underweight. Neurological disease was the most common diagnosis for dysphagia. Growth failure was more evident in children with neurological impairment than neurologically intact children.

Abbreviations: CI: Confidence interval; ENT: ear nose throat; FEES: fiberoptic endoscopic evaluation of swallowing; ICU: intensive care unit; NICU: neonatal intensive care unit; SD: standard deviation; VFSS: videofluoroscopic swallow study; WHO: World Health Organization.

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Declarations

Availability of data and materials: The data collected and analysed can be obtained from the corresponding author upon reasonable request.

Ethics approval: This study has received the approval of ethical committee of Faculty of Medicine, Cairo University.

Consent for publication: All authors have consented to the publication of the manuscript.

Competing interests: All authors declare that they have no competing interests.

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